# Editorial

## Wood & Other Renewable Resources (Subject Editor: Jörg Schweinle)*

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### Challenging wood (in) LCA

We are looking back on about 25 years of experiences of assessing and comparing wood products in LCA. Wood as a renewable raw material with a comparably low resource input for its extraction has a great potential as an environmentally favourable material. Indeed, many life cycle assessments show favourable results for wood products (Werner and Richter 2007, this issue). However, it would be misconceiving actual market challenges for the wood industry to rest on their laurels. Environmental impacts of ancillary materials such as adhesives and glues, fittings, paints and lacquers but also wood preservatives or products used for maintenance can impact the environmental profile of wood products much beyond the profile of wood *per se*. Continuous technological improvement and a wise application of wood suiting the site-specific conditions – and of course a continuous monitoring with LCA – will be required to maintain the positive perception of wood in public. However, even within the traditional wood manufacturing processes there is a lot of potential for improvement. Drying of wood for example is one of the most energy intensive steps and provides some potential for improvement which can be highlighted through LCA studies.

This observation is not only true for 'traditional' wood products. Schweinle (2007) has listed some exciting examples of innovative wood applications whose environmental performance will still have to be assessed. In addition to that, experiences with particularly dry weeks last winter in Europe have demonstrated impressively, how the generally environmentally favourable image of wood energy has been hampered by an increased level of particulate matter in atmosphere due to wood-fuelled heating systems (and diesel engines).

Those are the challenges that wood industry will have to address on its path toward better sustainability.

This brings us to open questions and existing research needs related to life cycle assessment and wood.

### Wood and climate change

One of the most noticeable developments for the positioning of wood in the sustainability discussion of the last fifteen years was the raising public awareness of climate change. Indeed, wood as a potentially carbon-neutral material can help to mitigate climate change in various ways. The greenhouse gas (GHG) dynamics related to the production, use and disposal of wood products, however, are manifold and show a complex time pattern. On the one hand, wood products can be considered as a carbon pool, as is the forest itself.

On the other hand, an increased use of wood – though related to fossil fuel emissions from the production of wood products – can lead to the substitution of usually more energy-intense materials and to the substitution of fossil fuels when the thermal energy of wood is recovered. Country-specific import/export flows of wood products and their alternative products as well as their processing stage have to be considered if substitution effects are accounted for on a national basis. First attempts have been undertaken to combine material flow analysis with LCA data to assess different forest management and wood use scenarios (Werner et al. 2006, Hofer et al. 2007). However, there is still a considerable effort required to optimizing wood flows from an energy and climate perspective.

### Wood in environmental product declarations

Environmental product declarations (EPDs) according to ISO 14025 are increasing in public awareness. EPDs provide a sound basis for the communication of environmentally relevant information on a product based on LCA (Schmincke and Grahl 2007). Several nationally oriented EPD programmes have emerged throughout the world – some of them concentrating on building products as one main application field for wood (www.gednet.org). Standardisation efforts for building EPDs and the related environmental assessment of buildings are currently undertaken by the International Standardisation Organisation (ISO 21930 and ISO 21931) as well as by the European Standardisation Committee (CEN TC 350). In both initiatives, 'accounting rules' for all building products will be fixed that will be internationally binding. Practical experiences on implications of specific accounting rules will be essential to avoid an inadequate representation of materials and products in EPDs – not only for wood but for all materials and products.

### Need for further methodological development

Reasoning about inadequate representation of wood brings us to the need for further methodological development of LCA. Up to now, it is hardly possible to depict key issues of sustainable forestry in LCA such as logging impacts (or impacts of reduced impact logging), positive or negative impacts on biodiversity, etc. This is largely due to the fact that

* Barbara Nebel and Frank Werner are Editors associated to Jörg Schweinle, the Subject Editor for the area 'Wood & Other Renewable Resources'. In this Editorial they continue and complement, from their point of view, Jörg Schweinle's Editorial in Int J LCA 12 (3) 141–142 (Schweinle 2007).

no international consensus has been achieved on how to inventory and assess physical impacts of land use and land use change. This challenge is manifold, including the need for site-specific data, site-specific impact models and of course the broad variety of land uses and potential impacts and cause-effect relations. Such inventories and assessment methods will have to address very different land uses such as meadows, extensive pastures, agricultural uses, boreal to tropical forest and also completely paved areas. On the other hand, a high level of detail is required if for example impacts of different ways of logging should be assessed. The same is true if certified sustainable forest management should be compared to any other way of forest management (Schweinle 2001).

The increasing opportunities and availability of remotely sensed environmental data and its combination with site-specific LCI databases and impact models will provide a challenging research field to address land use impacts in LCA.

Another aspect, which might increase in importance over the next decades are impacts on the hydrological cycle. Ignored so far in LCA, increasing regional shortage of drinking water might become a resource related safeguard in its own right. Assessment methods will need to be developed to depict the hydrological cycle – including forests – and to assess potential impacts on it.

The huge number of different forest management systems also requires some further thoughts on methodological aspects. On the one end of the scale, there are short rotation crops with a possible rotation period of only three years. On the other end of the scale, there would be for example mixed stand oak forests with a rotation period of up to 350 years. Service life of wood products then might easily last 100 years or more. These timeframes are currently still very difficult to handle in LCA, especially when thinking about the storage of carbon and the potential benefits related to this carbon sink. The potential, however, is considerable: Böswald has worked out that 13% of the anthropogenic emissions of $CO_2$ were mitigated by biological uptake (Burschel and Weber 2001, Böswald 1996). On a global level wood products store an amount of C which is equivalent to 2.5% of the $CO_2$ emissions released by burning fossil fuels and from cement production (Schimel 1995).

### Tropical wood in LCA

Impacts of land use change have prominently been discussed related to the use of tropical wood and deforestation. It is particularly noteworthy that LCI data on tropical timber is very scarce and mostly limited in its quality and representativeness (Murphy 2004, Werner 2007). Natural site conditions and forest management practices in tropical forests, socio-economic circumstances as well as species-specific material properties of tropical wood can vary considerably. These factors can have decisive influence on data inventories of tropical wood. On the other hand, process data are usually only available from companies with (close to) sustainable forest management practices; LCI data on unsustainable forest management practices or illegal logging will hardly be available – which lies in the nature of the cause.

An environmental topic receiving much public attention in Europe is the deforestation of tropical rainforests. This brings us back to the methodological difficulties to assess physical impacts of land use change. In the context of tropical forestry, the issue is even more difficult as deforestation results from complex site-specific, political and socio-economic interactions, of which logging is only one of the minor players.

To make things even more complex: using wood from tropical forests in a sustainable way gives this valuable resource a market value, which might be decisive for the longterm conservation of tropical forests. Experiences of the last decades have shown that unreflected bans on tropical wood – resulting in a non-use – have not been able to stop tropical deforestation. On the contrary, evidence exists that price cuts for tropical timber have even increased deforestation rates for the conversion of forests to agricultural or pastoral lands.

Including such 'opportunity effects' or non-use effects in LCA to fully cover the mindset and values of decision makers is a different story, whose exploration goes far beyond this editorial.

As we have tried to point out: there is a lot to be done. We are very happy to contribute to Int J LCA as Assistant Subject Editors and invite you as authors and readers for a lively interaction and a prosperous development in the field of wood and other renewable materials in LCA.

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